

**Claims**

1 A bucket conveying machine comprising:

a first working conveyor having a first upstream end and a second downstream end, said first conveyor being adapted to convey a plurality of buckets resting freely thereon  
5 from said first end to said second end;

a second return conveyor adapted to return buckets from the second end of said first conveyor to the first end thereof;

drive means for driving said first and second conveyors;

first transfer means for transferring buckets from the first conveyor to the second  
10 conveyor at said second end; and

second-transfer means for transferring buckets from the second conveyor to the first conveyor at said first end.

2 A bucket conveying machine as claimed in claim 1, wherein said second return conveyor is selectively movable between a coupled position in which said return conveyor  
15 is arranged to supply buckets to said second transfer means for return to the first conveyor and a second decoupled position in which said second conveyor is arranged to discharge buckets from said machine.

3 A bucket conveying machine as claimed in claim 2, wherein said drive means comprise a reversible drive associated with said second conveyor, said reversible drive  
20 being operable in a first direction for discharging buckets from the machine and a second opposite direction for loading buckets onto the second conveyor.

4 A bucket conveying machine as claimed in claim 2 or claim 3, further comprising selectively operable positioning means for automatically positioning said second conveyor in said first coupled position or said second decoupled position.

25 5 A bucket conveying machine as claimed in claim 2, claim 3 or claim 4, further comprising a third take-off conveyor adapted to receive buckets from the return conveyor in said decoupled position.

6 A bucket conveying machine as claimed in claim 5, wherein said third take-off conveyor is adapted to load buckets onto the return conveyor in said decoupled position.

30 7 A bucket conveying machine as claimed in any of claims 1 to 6, wherein said first conveyor comprises an endless belt arranged for rotation in a substantially vertical plane around a closed path, said belt having an upper conveying surface extending between said first and second ends.

8       A bucket conveying machine as claimed in claim 7, wherein said first transfer means comprises a first magnetic transfer wheel which is adapted to pick-up magnetic or magnetisable buckets at the downstream end of the first conveyor and deliver said buckets to the return conveyor.

5       9       A bucket conveying machine as claimed in claim 7 or claim 8, wherein said second transfer means comprises a second magnetic transfer wheel which is adapted to pick-up magnetic or magnetisable buckets from the second conveyor and deliver said buckets to the upstream end of the first conveyor.

10       10       A bucket conveying machine as claimed in claim 7, claim 8 or claim 9, wherein said endless belt comprises a lower run, and said return conveyor is disposed beneath said lower run such that buckets on the return conveyor remain in contact with or closely adjacent said belt.

11       A bucket conveying machine as claimed in claim 10, further comprising means for adjusting the spacing between the lower run of said belt and said second conveyor.

15       12       A bucket conveying machine as claimed in claim 8 or claim 9, wherein said return conveyor can be selectively tilted to decouple the return conveyor from one of said first or second transfer wheels, whilst remaining coupled with the other of the second or first transfer wheels.

20       13       A device for controlling the position of one or more buckets on a conveyor, particularly at a product loading station, or a bucket accumulating station, of the conveyor, said device comprising:

          a first conveyor adapted to convey a plurality of buckets thereon;

          a second conveyor provided at a station on the first conveyor, said second conveyor being disposed above the first conveyor;

25       first transfer means for transferring buckets on said first conveyor onto the second conveyor at the station, such that the buckets are removed from the first conveyor;

          servo drive means for driving said second conveyor to control the position of the buckets; and

30       second transfer means for transferring buckets from the second conveyor back onto the first conveyor, or onto another conveyor.

14       A device as claimed in claim 13, wherein said second conveyor comprises an endless belt which is positioned juxtaposed the first conveyor, said endless belt being arranged for rotation in a substantially vertical plane around a closed path, and having an upper run extending between first and second ends thereof.

15 A device as claimed in claim 14, wherein said upper run of the endless belt is positioned above the level of the first conveyor, such that buckets transported from the first conveyor onto the second conveyor are lifted up from the first conveyor, out of contact with the first conveyor.

5 16 A device as claimed in claim 15, further comprising means for guiding the endless belt of the second conveyor for guiding buckets from the first conveyor onto the second conveyor, and up to the level of the upper conveying run thereof.

17 A device as claimed in claim 15 or claim 16, further comprising means for guiding the endless belt of the second conveyor to guide buckets from the upper conveying run of  
10 the endless belt of the second conveyor back down onto the first conveyor for onward transport thereon.-

18 A device as claimed in any of claims 13 to 17, wherein said second conveyor is dimensioned to accommodate a pre-determined number of successive buckets thereon.

19 A device as claimed in any of claims 13 to 18, wherein said second conveyor  
15 comprises magnetic means adapted to attract magnetically buckets which are provided with cooperating magnetic or magnetisable means, whereby the buckets are held firmly in contact with the second conveyor when disposed thereon.

20 A device as claimed in claim 19, wherein each bucket comprises a magnetisable element, and the second conveyor may comprise a magnetic element positioned beneath  
20 the upper run of the endless belt of the second conveyor for attracting the magnetisable means in each bucket.

21 A bucket conveying machine for collating product units comprising:

a plurality of buckets, each bucket being adapted to receive one or more product units;

25 a first working conveyor having a first upstream end and a second downstream end, said first conveyor being adapted to convey said buckets resting freely thereon from said first end to said second end;

a loading station on said first conveyor intermediate said first and second ends for loading a predetermined number of product units into each bucket from a product infeed;

30 an accumulating station on said first conveyor downstream of said loading station for accumulating said buckets to form groups comprising a predetermined number of buckets;

an cartonning station on said first conveyor downstream of said accumulating station for unloading product units from said groups of buckets;

a second return conveyor adapted to return empty buckets from the second end of said first conveyor to the first end thereof;

drive means for driving said first and second conveyors;

first transfer means for transferring said buckets from the first conveyor to the  
5 second conveyor at said second end; and

second transfer means for transferring said buckets from the second conveyor to the first conveyor at said first end.

~~22~~ — A machine as claimed in claim 21, wherein said buckets are magnetic buckets.

23 A machine as claimed in claim 21 or claim 22, wherein at least one of said product  
10 loading station and said accumulating station comprises a device for controlling the position of the buckets as claimed in any of claims 13 to 19.

24 A machine as claimed in claim 22 or claim 23, wherein said product loading station or the accumulating station is adapted to accelerate said buckets or groups of buckets to at least the speed of the first conveyor.

15 25 A machine as claimed in any of claims 20 to 24, wherein said cartonning station comprises a lug conveyor juxtaposed said first conveyor, said lug conveyor comprising one or more spaced abutments adapted to engage said groups of buckets, and servo drive means for controlling movement of said lug conveyor to control the spacing of said groups.

26 A machine as claimed in claim 25, wherein said lug conveyor is adapted to run  
20 more slowly than the first conveyor.

27 A machine as claimed in claim 25, wherein said lug conveyor is adapted to run faster than said first conveyor.

28 A machine as claimed in any of claims 20 to 27, further comprising means for detecting buckets at each of said loading and accumulating stations.

25 29 A machine as claimed in claim 28, further comprising means for detecting a predetermined maximum number of buckets at said loading station.

30 A machine as claimed in claim 29, further comprising selectively operable bucket holding means adapted to restrain buckets on said second conveyor and controlling means for automatically operating said holding means if the maximum number of buckets is  
30 detected at said loading station.

31 A machine as claimed in any of claims 20 to 30, further comprising a plurality of different sets of buckets, the buckets of each set being suitable for use with a different respective size of product unit.

32 A machine substantially as hereinbefore described with reference to and as illustrated in FIGS. 1 to 9 of the accompanying drawings.

33 A device for controlling the position of one or more buckets on a conveyor,  
particularly at a product loading station, or a bucket accumulating station, of the conveyor  
5 substantially as hereinbefore described with reference to and as illustrated in FIGS. 6 to 9  
of the accompanying drawings.